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IRRIGATED PASTURES

**SPECIES • ADAPTATIONS
SEEDING • MANAGEMENT**

"The ultimate goal of every irrigated pasture should be . . . to produce the greatest amount of the most nutritious feed over the longest grazing season."

—BURLE J. JONES



Compiled by

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IRRIGATED PASTURES

This booklet is presented as a digest of successful practices and of current research on this popular, economical and rapidly expanding method of feeding livestock on irrigated lands in California. It is realized that a brief brochure cannot cover all differences in soils, available water supplies and climatic conditions. Successful local experience is the best guide in pasture establishment and management.

SALIENT ADVANTAGES of permanent pasture:

Provides highest quality of feed. Nothing quite takes the place of natural green pasturage.

Reduces cost of feeding, livestock harvest it themselves.

High per acre production with low cost.

Provides green feed through the long, dry summer.

Improves soil fertility and therefore fits into:

A long-time crop rotation for soil improvement.

SELECTION OF SPECIES: Occasionally one grass or legume is seeded alone, but it is usually more desirable to use a mixture of grasses and legumes to provide a better balanced feed, to promote animal health and production and to reduce bloat hazard.

In planting such a mixture, consideration should be given to the natural and seasonal growth habits of each species so as to attain the ultimate objective of permanence, high carrying capacity and the longest possible season of growth and pasturage.

Species of both grasses and legumes should be selected with respect to their adaptability to existing soil and climate, irrigation facilities; and to the kind of stock to be pastured.

A RECENT SURVEY of 43 counties shows that the following species and amounts of seed per acre occur with the greatest frequency as a result of about 25 years of tests and practical experience: Ladino clover 3, Birdsfoot Trefoil 2, Common Ryegrass 2, Perennial Ryegrass 2, Orchard Grass 3, Tall Fescue 3; a total of six species and 15 pounds per acre of seed. This might be considered as a standard mixture for average soil and irrigation conditions. To these are sometimes added one or more of such others as Alfalfa, Bur Clover and Dallis Grass. SPECIAL CONDITIONS, such as sandy or alkali soils, infrequent irrigation intervals or high elevations require special mixtures more suitable for them. Here local experience or expert advice should be sought.

FOR CATTLE AND SHEEP: Seed 25 to 40 per cent legumes. This percentage has been found to best meet the requirements of animal nutrition and grazing preferences with a minimum of bloat hazard.

FOR HOGS: Seed only legumes.

FOR HORSES: Seed grasses with not over 10 to 20 per cent legumes.

KNOW WHAT YOU SOW: Too much stress cannot be placed on the quality of seed to be sown. The best source of supply is a reliable, established seed dealer. Labels and tags should be examined and checked for variety, strain, purity, weed content and germination to procure the best seed available. Seed of high germination usually produces stronger and healthier plants than those of low germination. Weeds are costly boarders in irrigated pastures; don't invite them in as guests. Ask your dealer for Volkman seeds and *know what you sow*.

SOIL PREPARATION FOR IRRIGATION: There are four methods of irrigation: (1) Strip check, (2) Contour flooding, (3) Wild flooding, (4) Sprinkling. The last two require little soil preparation for water distribution. In contour flooding the contours are on an even grade at from .1 to .4 foot intervals depending on the topography of the land. Water is usually spilled from each check to the one below with adequate drainage at the bottom to avoid swamping. Strip checking is the most prevalent method. Here it is important to have a level grade between checks so that there will be an even distribution of irrigation water. Where there are fills of any depth the grade should be settled by pre-irrigation and then regraded. This eliminates "pot holes" in which water will stand and scald out the pasture plants. Good drainage is essential to carry water off the lower end of the checks and avoid swamping there. Adequate soil preparation pays good dividends in higher yields and longer-lived stands.

SEEDING PRACTICES: Most pasture seeding is now done by broadcasting using hand or power seeders or sowing by airplane. There should always be a firm seed bed and a light covering over the seed. A seedbed suitable for Alfalfa will give best results with irrigated pastures. Slight corrugations produced by light tothing or cultipacking are desirable. After seeding it is best to cultipack the soil to firm the seed into it. (There may be exceptions in very heavy soil.) With this in mind it is good practice to do the whole job with a double cultipacker-seeder when that tool is available.

BLENDING: Some airplane seeders prefer to seed grasses and legumes separately; others do a good job planting all at one flight. With a breast seeder or small hopper, the whole mix may be sown at once. With a large hopper sowing blended grass and blended legume seed separately is advised to avoid shakedown of fine seeds.

Excessive seeding is costly and wasteful. Wide experience has demonstrated that the best eventual stand can be had from moderate amounts of seed sown on a well prepared seedbed.

TIME OF SEEDING: It is optional to seed in either fall or spring, but fall seeding is recommended when it can be done at the proper time. Fall and winter moisture and temperatures are usually favorable for plants to establish themselves so that vigorous and sturdy growth follows in the spring. There is less danger of soil crusting to prevent plant emergence at that time of the year. Where there is danger of continued cold weather spring planting is advisable.

MANAGEMENT: The full value of a permanent pasture is seldom obtained the first year. Many seeded perennials do not fully develop until the second or third season. The ryegrasses start rapidly like annuals and provide an abundance of feed the first season. But when sown too heavily they tend to crowd out the slower starting perennials so that the eventual mixture may not be fully representative of the species used. Since permanence is desired the ryegrasses should be used sparingly.

Grasses and legumes have the highest nutritive values up to the bloom stage of each recurrent growth period. During this stage of growth proteins, vitamins and minerals are in some cases three to four times as great as they are at the mature stage. The early growth, after the leaves are fully formed, is also more palatable and digestible and less fibrous. Pastures grazed during this period will return the highest values in meat and milk. Neither a uniform diet nor good nutrition can be obtained by transferring stock from closely cropped pastures to lush growth.

Overgrazing weakens the stand by not allowing the plants to nourish themselves and maintain vigorous growth. This invites weeds to occupy the spaces vacated by dead or weakened pasture plants. Overgrazing often upsets the balance of grasses and legumes originally planted resulting in an undesirable predominance of one or the other. The objective should be to avoid the soft wateriness of very young plants by overgrazing, or fibrous overmaturity by undergrazing.

On some soils a natural predominance may eventually take place in favor of either the grasses or the legumes. This can often be overcome by adopting a fertilizer program. Grasses will invariably respond to nitrogen. Legumes usually respond to phosphate or sulphur.

Whenever a pasture shows a tendency to become coarse, stemmy, or tufty, and is reaching an advanced stage of maturity where it is not relished by pasturing stock, then the mower should be used to reduce the sward and bring it back to grazing proportions.

Properly regulated continuous pasturage, or short grazing rotations calculated to keep the forage at reasonably uniform height and maturity will result in an even and uniform ration, good animal nutrition and health with a maximum per acre yield of meat or milk.



GRASSES AND HERBS

COMMON NAME	BOTANICAL NAME	ADAPTATION	SEEDING RATE—POUNDS PER ACRE		GENERAL INFORMATION
			ALONE	IN MIXTURES	
Bluegrass Kentucky	Poa pratensis	Well drained loams, temperate regions of high humidity, or high elevations. Not adapted to regions of high temperatures.	10 to 15	1 to 4	Erect, creeping and sod-forming, early maturing, lacks leafiness and not a high producer. Very aggressive where it thrives.
Bromegrass Prairie No. 25	Bromus catharticus	All valley areas. Best growth on loamy soils.	8 to 12	2 to 4	Erect, tall, leafy. Produces abundant, palatable early spring growth. Excellent for dairy pasture.
Bromegrass Smooth	Bromus inermis	Deep clay or clay loam soils at high elevations. Not well adapted to warmer valleys.	8 to 12	2 to 4	Erect, creeping rootstalks, tall, leafy, long growing season.
Dallisgrass	Paspalum dilatatum	All soils, hot to cool climate. Does not survive severe winters. Will withstand submergence.	4 to 10	2 to 4	Tall, angled bunchgrass, winter dormant. Strong growth in hot weather. Quick recovery after grazing. Growing in popularity for beef cattle.
Fescue, tall Alta Ky 31	Festuca arundinacea	All pasture soils and climatic conditions. Good alkali tolerance.	6 to 10	2 to 5	Tall, erect, deep-rooted bunchgrass. Excellent palatability and long growing season. Careful management needed to prevent bunching. Not recommended for sheep pasture.
Goar tall Fescue	Festuca arundinacea	Warm climate areas. High alkali tolerance.	6 to 10	2 to 5	Strong seedling vigor and more heat tolerant than other Fescues. Combines well with Narrowleaf Birdsfoot Trefoil in revegetating alkaline soils.
Hardinggrass	Phalaris tuberosa Var. stenoptera	Best on loams with heavier subsoil. Medium temperatures and elevations. Does not withstand continued severe cold.	2 to 6	1 to 4	Tall, leafy with short rhizomes, winter growing in its best range. Difficult to start in a mixture. Best use where irrigation is infrequent.
Meadow Foxtail	Alopecurus pratensis	Wide soil range at medium to high elevations. Best in wet, or seepage, land.	4 to 10	2 to 4	Tall, leafy bunchgrass. More palatable than reed canary grass. Popular in Oregon. Early spring growth. Endures shade.
Orchardgrass Common	Dactylis glomerata	All soils, but adobe, moderate alkali tolerance, wide climatic range.	6 to 12	2 to 4	Tall, erect bunchgrass, leafy. Long growing season. Tufty unless controlled by grazing and mowing. Will grow in part shade.
Orchardgrass Akaroa	Dactylis glomerata	Wide adaptation both soil and climate.	6 to 12	2 to 4	Leafier, more uniform, and produces more forage than common orchardgrass.
Reed Canarygrass	Phalaris arundinacea	Swampy and bottom lands at high elevations or near coast.	4 to 10	Used alone	Very tall erect, slightly creeping, leafy and coarse. Starts growth early. Too tall for association with other species. Withstands prolonged submergence.
Rhodesgrass	Chloris gayana	Wide soil adaptation. Very alkali tolerant. Will not survive winter temperatures below 18° F.	5 to 8	1 to 4	Erect, leafy with long runners that root at the nodes. Strong summer grower. First grass to use in reclaiming alkali land.
Ryegrass Common (Annual)	Lolium multiflorum	Wide soil and climatic range. Winter growing in the central and southern part of the state.	5 to 10	1 to 4	Medium tall, annual, perennial under irrigation, stems leafy. Strongest growth in fall and spring. Starts rapidly, should be used sparingly in mixture.
Ryegrass Perennial	Lolium perenne	Wide soil and climatic range.	5 to 10	1 to 4	Less tall than common ryegrass, leafage mostly basal. Continues to yield later than common. Sometimes rusts near the coast.
*Sudangrass Sudan 23	Sorghum vulgare Var. sudanense	Medium to good soils wherever summer frosts are not prevalent. Drought hardy when established.	12 to 25	Used alone	Very tall erect, summer growing annual. Sudan will produce large amounts of green pasture under occasional irrigation. A California station selection of common Sudan.
*Sweet Sudan	Sorghum sp.	Medium to good soils where frost free. About as drought hardy as Common Sudan.	12 to 25	Used alone	A Texas cross of Sudan and Sweet sorghum. Stems are sweet and relished by livestock. Annual.
Tall Oatgrass Tall Meadow Oatgrass	Arrhenatherum elatius	Acid, neutral or slightly alkaline soils. Central and north coast and high elevations.	10 to 15	3 to 8	Tall erect bunchgrass with leafy stems. Most useful in its range in a hay and pasture rotation.
Tall Oatgrass Tualatin	Arrhenatherum elatius	Central and north coast and high elevations. Experience may develop a wider range.	10 to 15	3 to 8	A selection of tall Oatgrass. Less tall with more basal leaves. Probably better adapted to irrigated pasture.
Wheatgrass Standard Crested	Agropyron desertorum (formerly Agropyron cristatum)	Wide soil range at high elevations (2500 feet or over) and severe winters. Moderate alkali tolerance.	10 to 12	2 to 4	Medium tall, deep-rooted bunchgrass, leafy stems, somewhat harsh but palatable. Recommended in its range only where irrigation is infrequent.
Wheatgrass Intermediate	Agropyron intermedium	Same regional adaptation as Crested Wheatgrass. Stands more moisture than Crested with similar alkali tolerance.	10 to 12	2 to 4	Perennial sod forming type of wheatgrass. Produces abundant leafy foliage. Has strong seedling vigor and establishes itself quickly. Occasionally used in irrigated pastures in high elevations.
Wheatgrass Tall	Agropyron elongatum	Wide soil range at high elevations. Excellent alkali tolerance.	8 to 12	2 to 4	Occasionally used for hay production in mountain meadows. Good forage value.

LEGUMES

Alfalfa Common Caliverde No. 49	Medicago sativa	Deep, well drained permeable soils and all elevations and latitudes. Caliverde resistant to bacterial wilt and leaf spot. No. 49 resistant to alfalfa dwarf.	10 to 20	1 to 5	Erect, tap-rooted. Grows throughout the summer and fall. Used in pastures chiefly on soils too light for ladino and where summers are so hot that ladino growth sags, or where irrigation is infrequent.
Alsike clover	Trifolium hybridum	Acid or neutral soils, especially those of heavy texture. At high elevations and on sites too wet for ladino.	5 to 20	1 to 5	Semi-erect, leafy, sparsely hairy. A common ingredient of pastures in the north-eastern part of the state. At low elevations it is used where drainage is poor.
Birdsfoot trefoil Narrowleaf (prostrate)	Lotus tenuis	Wide range of soil and climatic conditions. Moderately alkali tolerant.	3 to 5	1 to 3	Prostrate, except where held up by close association, long runners, leafy, deep-rooted. Highly palatable except when in bloom. Less likely to bloat cattle and sheep than ladino, commonly sown with ladino to add variety. Withstands submergence.
Birdsfoot trefoil Broadleaf (erect)	Lotus corniculatus Var. vulgaris	Wide range of soil and climatic conditions. Best growth in neutral or acid soils.	3 to 5	1 to 3	Stronger stemmed than narrowleaf, semi-erect. Leaflets over half as wide as long. Recovers rapidly after grazing. Low bloat hazard. Highly palatable except when in bloom.
Big trefoil	Lotus uliginosus (L. major)	Seepage and marshy lands, coastal and semi-coastal conditions, especially north coast.	1 to 4	½ to 3	Larger and more erect than birdsfoot. Generally requires inoculation.
*Bur clover	Medicago hispida	Best in heavy soils at elevations where winter temperatures permit growth.	4 to 8	1 to 3	Semi-prostrate, leafy winter annual. Furnishes winter pasture where temperatures are mild.
Ladino clover	Trifolium repens Var. latum	Wide range of soils except sandy. Moderate alkali tolerance. All climatic zones except very cold winters and extreme summer heat such as Imperial Valley.	4 to 8	1 to 5	Semi-erect, with runners, no central stems. Very leafy, shallow rooted, requiring frequent irrigation. Recovers rapidly after grazing. The most popular pasture legume. Seeding alone is not recommended for cattle and sheep, due to bloat hazard.
Red clover	Trifolium pratense	Well drained soils of mountain meadows and high elevation pastures.	4 to 8	1 to 3	Semi-erect, short-lived perennial. Leafy, strong sturdy growth. A fine clover for hay, with aftermath of pasture where not subject to mildew.
Strawberry clover, Common Palestine	Trifolium fragiferum	Wide soil range but especially adapted to those of alkali reaction. Endures cold winters and all but extreme summer heat.	4 to 8	1 to 3	An understory legume with long runners rooting at the nodes. Leafage short but abundant. Shallow rooted. Late fall growth. Creeping habit helps to fill open spaces, adds variety to the diet.
Strawberry clover Salina	Trifolium fragiferum	Not as winter-hardy as common Strawberry clover. Tolerates moderate alkali and poorly drained soils.	4 to 8	1 to 3	A recent California development. Produces abundant winter and early spring feed. Has tap root as well as deep fibrous root system, therefore much more drought tolerant than Ladino Clover. Seed expected to be available in 1954.
*Subclover (subterranean clover)	Trifolium subterraneum	Wide range of soil texture. Prefers acid soil, tolerant of mild alkalinity. Same climatic range as Bur clover, where temperatures permit winter growth.	3 to 6	1 to 3	Annual, semi-prostrate, with runners. Pegs part of its seed into the soil. Useful in irrigated pastures only to supplement or replace Bur clover as winter and early spring pasture. Two strains popular: Mt. Barker midseason, and Late Tallarook.
White clover White Dutch Clover	Trifolium repens	Wide range of soil and climate. Used in irrigated pastures only where winters are severe.	4 to 8	1 to 5	Growth habit like ladino, but much smaller. Less productive but more winter hardy than ladino.
*White Sweet Clover	Melilotus alba	Wide soil and climatic range, useful chiefly in sandy and alkali lands.	4 to 10	1 to 5	Biennial, tall, branching, leafy, tap-rooted. Moderately palatable. Volunteers after second year if not too closely grazed.
*Yellow Sweet Clover	Melilotus officinalis	Wide soil and climatic range. Adapted chiefly to use in sandy and alkali soils.	4 to 10	1 to 5	Biennial, branching, tap-rooted. More leafy, less tall than white. Useful in reclaiming alkali land.
*Yellow Sweet Clover Madrid	Melilotus officinalis	Wide soil and climatic range. Included in pasture mixtures on sandy and alkaline soils.	4 to 10	1 to 5	Biennial tap-rooted variety, more leafy and robust than Yellow Sweet Clover. Dark green foliage. Strong seedling vigor and produces earlier feed.

*All items are perennial unless otherwise noted.

REFERENCES

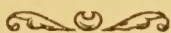
For specific recommendations regarding Irrigated Pasture seeding and management, write or contact the Pasture Department, C. M. Volkman & Company, 55 Union Street, San Francisco.

Local County Farm Advisors may also be excellent sources of information since they are constantly in touch with local conditions.

Further information can be secured from the College of Agriculture, Circular No. 125 (Revised) entitled "Irrigated Pastures in California."

PALATABILITY

Many attempts have been made to set up definitions of the comparative palatability of pasture plants. Palatability is an illusive term that has no fixed status and upon which authors and investigators are not in agreement. It varies with climatic and soil conditions and other environmental factors. The sweet clovers, lupins and some others that contain coumarin or other bitter elements, at all times or at certain stages of growth, are not relished by livestock at the first contact, but sweet clovers are usually consumed after a taste for them has been developed. Palatability also varies with the stage of growth and is directly related to nutritive values and fiber content. It is, then, closely related to pasture management. All plants recommended for pasture planting can be considered as high in this respect. Beyond a few extremes noted for some species, degrees of palatability are not definable in any terms that are likely to be of value to graziers.



NUTRITIVE VALUES

The differences in actual feed values among the various grasses and the legumes used in pasture mixtures are not great enough to be significant.

Legumes are lower than grasses in percentage of dry matter and higher in protein. Grasses are higher in total digestible nutrients and in crude fiber.

When grazing management is so regulated that the plants are consumed at some stage between full leaf maturity and the beginning of seed formation the highest nutritive values will be secured.

Mixtures of grasses and legumes have long since been demonstrated as desirable for variety in the diet and for the best nutrition of cattle and sheep.

